



SILVER LEVEL CHALLENGE #4



Calculators may be used.

Name _____

1. 7 Zan has created this rule for generating sequences of whole numbers:

If a number is 15 or less, triple the number.
If a number is more than 15, subtract 13 from it.

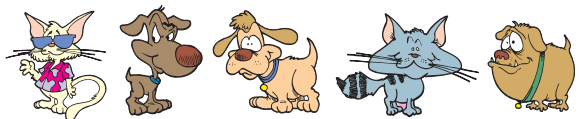
Therefore, if Zan starts with 10, she gets the sequence 10, 30, 17, 4, 12, If the first number in Zan's sequence is 34, what is the 8th number in the sequence?

Starting with 34, the sequence of numbers would be: 34; $34 - 13 = 21$; $21 - 13 = 8$; $8 \times 3 = 24$; $24 - 13 = 11$; $11 \times 3 = 33$; $33 - 13 = 20$; $20 - 13 = 7$.

2. 70 If $3x + 8 = 5x - 6$, what is the value of the product $10x$?

Let's begin by getting all of our terms with an x on the same side of the equation. Subtracting $3x$ and adding 6 to both sides of the equation results in $14 = 2x$. Multiplying both sides of this new equation by 5, we see **70** = $10x$.

3. 3/10 Of the five finalists in the Sumville Cutest Pet Contest, three are dogs and two are cats. If two will be chosen at random to be the final two contestants, what is the probability that both will be dogs? Express your answer as a common fraction.

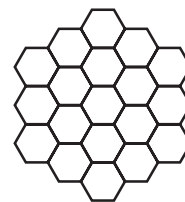


We must select two pets. The probability that the first will be a dog is $3/5$. Assuming a dog is selected first, the probability of selecting a dog second is $2/4$. Therefore, the probability of selecting two dogs is $(3/5)(2/4) = 6/20 = \mathbf{3/10}$.

4. 106 What is the value of x such that the list 100, 102, 104, x , x , 106, 104, 118, 113, 101 has the same mean and mode?

Let's write our list with our known values in order so that we can see more easily if we have any duplicate values: 100, 101, 102, 104, 104, 106, 113, 118, x , x . Looking at this, we can see that the value of x will be the mode since the most of any other value we have is two and there are two x s. (If x does not have the same value as any of our current values, we will have two modes: x and 104. However, the problem implies there is just one mode, so most likely x will have a value equal to one of those in our list.) The mean of our values can be represented as $(100 + 101 + 102 + 104 + 104 + 106 + 113 + 118 + x + x) \div 10$, and we know this is equal to our mode, x . So we have $(848 + 2x) \div 10 = x \rightarrow 848 + 2x = 10x \rightarrow 848 = 8x \rightarrow x = 106$, which is equal to one of our known values.

5. 3 colors What is the fewest number of colors that can be used to color the 19 hexagonal pieces so that no two of the hexagonal pieces sharing a side are the same color?



Since three hexagons come together at every vertex, it is clear that we will need at least three colors to color all 19 hexagons. Also, from the point of view of any one hexagon, the six surrounding hexagons must alternate between the other two colors. This can indeed be done in 3 colors, as shown here.

